REMARKS/ARGUMENTS

Claims 22-32 are pending. Claim 23 was indicated to be allowable. Claims 22 and 24-30 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,595,052 to Wharton in view of U.S. Patent No. 6,067,862 to Murray et al. It appears that Claims 31 and 32 have not been treated on the merits.

The indication of allowability of Claim 23 is greatly appreciated. However, for the reasons given below, it is submitted that all pending claims are allowable over the cited references.

Response to Rejections

The invention defined by Claim 22 concerns a gripping device for a manipulation system comprising a robot for receiving parts and feeding a manufacturing plant with a workpiece from a readied stack of workpieces. The gripping device for this manipulation system comprises a gripper head that supports gripping means, and a detection system for detecting a workpiece received by the gripping means. The gripping device also comprises at least one pulse emitter acting upon the workpiece to excite vibrations in the workpiece, and at least one vibration sensor for sensing the vibrations of the workpiece, and a memory and/or analytical module structured and arranged to conduct a vibration analysis on a vibration signal from the vibration sensor. The detection system and the memory and/or analytical module jointly form a component part detachably arranged on the gripper head and in communication with a controller of the manufacturing plant via a bus system comprising an ASi bus.

Wharton does not disclose or relate to a gripping device for a manipulation system comprising a robot. Wharton describes a self-calibrating workpiece balancing machine for the precise correction of imbalances of rotating workpieces (col. 1, lines 11-12). The balancing machine is able to automatically determine and correct the imbalance of rotating parts and to

automatically self-calibrate under predetermined operating conditions. Wharton's machine **10** includes a workpiece holding unit or chuck **14** forming an extension of a cylindrical spindle **16**. The chuck **14** holds a workpiece **12**. A motor **28** rotatably drives the spindle for the rotational drive of the workpiece **12** about a spin axis **18**.

The Office Action acknowledged that Wharton does not disclose a robot-type manipulation system having a gripping device and comprising at least one pulse emitter acting upon the workpiece to excite vibrations in the workpiece (Office Action, p. 5). However, the Office Action cited Murray as teaching a robot-type manipulation system having a gripping device and comprising at least one pulse emitter acting upon the workpiece to excite vibrations in the workpiece (Fig. 1, elements 100 and 102; col. 13[1], lines 19-35). The Office Action asserted it would have been obvious to modify Wharton's gripping/holding device to be the gripping device of Murray, because introducing such a robot-type gripping/holding system into Wharton's system would have improved the efficiency and reliability of the gripping device.

Contrary to the Office Action, Murray does not disclose a gripping device comprising at least one pulse emitter acting upon the workpiece to excite vibrations in the workpiece. In fact, Murray's objective is entirely different from that of the present invention. Whereas in the present invention vibrations are *intentionally* excited in the workpiece gripped by the gripping device in order to deduce information about the workpiece (e.g., that it is actually two workpieces stuck together), in Murray any vibrations excited in the workpiece are purely *accidental and undesired.* The sole passage of Murray in which "vibrations" are mentioned relates to the description of Figure 15, which shows a gripped workpiece accidentally colliding with an obstacle. At col. 13, lines 19-33, Murray states (emphasis added):

> "In order to detect such an unplanned collision, the information generated by the sensors **210a** in response to impact forces [is] utilized. First, a threshold force value is set that is well above the noise level of the sensors **210a** and the nominal

[1] The Office Action actually cited col. **1**, lines 19-35, but this appears to be a typographical error, and it is presumed that col. 13 was intended.

> sensor readings produced by mechanical vibrations in the manufacturing system. If a force [greater] than the threshold is registered by the sensors **210a** during moves in free space, then an impact has occurred. When an impact or collision occurs, the sensor-based plan overrides the current robot **104** motion plan and, using the impact direction information obtained from the sensors **210a**, moves the robot **104** away from the obstruction."

A word search through Murray's disclosure indicates that the root "vibrat*" occurs only once (specifically, in the above-quoted passage). The root "puls*" does not occur anywhere in Murray. Thus, Murray does not teach or suggest using any pulse emitter to excite vibrations in the gripped workpiece.

It is true that Murray's gripping device employs sensors to detect *forces* exerted on the workpiece, but the forces that Murray cares about are *shear* forces between the workpiece and the gripper. Murray describes the sensors and their function at col. 3, lines 40-50:

> "Briefly described, these and other objects of the invention are accomplished by providing a set of sensors which are secured to the gripper of a robot for providing force and impact information for the workpiece held by the gripper. Each of the sensors is formed from a deformable rubber pad which includes an LED aligned opposite a position-sensitive detector such that, when the rubber pad and LED combination is deformed by a shear force, the output of the position-sensitive detector changes, thus providing an output current which is proportional to the effect of the force applied to the workpiece."

Thus, Murray's LED-type sensors are not designed for or intended for detecting vibrations in the workpiece.

It is also important to realize that Murray regards vibrations as noise that must be *ignored*, as made clear from the above-quoted passage from col. 13. Thus, Murray certainly does not want to intentionally cause vibrations in the workpiece, as that would be completely contrary to his purposes.

For these reasons, it is evident that both Wharton and Murray lack the claimed *pulse emitter acting upon the workpiece to excite vibrations in the workpiece*, as required by Claim 22.

Therefore, Applicant respectfully submits that Claim 22 is patentable over Wharton and Murray.

The invention defined by independent Claim 29 relates to a method for feeding workpieces from a stack of workpieces to a metal sheet folding machine for reshaping the workpieces by folding with a manipulation system, comprising the steps of:

gripping a workpiece at a top of the stack of workpieces using a gripping device;

lifting the gripped workpiece up from the stack with the gripping device;

exciting vibrations in the lifted workpiece using a pulse emitter arranged on the gripping device and acted upon by a controller;

sensing the vibrations in the workpiece using a vibration sensor arranged on the gripping device;

recording signals from the vibration sensor in a memory and/or analytical module; and

comparing a vibration spectrum of the workpiece stored in said module with reference vibration data;

wherein the vibration sensor is applied to a surface of the workpiece by a contact pressure-exerting device, whereupon a pulse is applied to the workpiece by the pulse emitter with a contact time of about 200 ms for exciting vibrations.

The Office Action's rejection of Claim 29 is deficient because it merely points to apparatus features of Wharton and Murray, but fails to point to any method steps in either of the cited references corresponding to the steps of Claim 29.

In fact, Wharton and Murray fail to disclose or remotely suggest the method steps recited in Claim 29. Nothing in Wharton or Murray would have remotely suggested exciting vibrations in a workpiece after the workpiece has been lifted from a stack of workpieces. In the claimed invention, this procedure allows the workpiece to be decoupled from and thereby unaffected by the other workpieces in the stack so that the vibrations detected in the workpiece are due only to the gripped workpiece (and possibly another workpiece stuck thereto). Only in

this manner is the memory/analytical module able to determine characteristics of the gripped and lifted workpiece (such as whether multiple workpieces have stuck together, or whether the gripped workpiece is the correct one). Wharton and Murray do not remotely suggest this aspect of Claim 29.

Moreover, the method of Claim 29 requires that the vibration sensor is applied *to a surface of the workpiece* by a contact pressure-exerting device, and that a pulse is applied to the workpiece by the pulse emitter *with a contact time of about 200 ms* for exciting vibrations. These aspects are also not disclosed or suggested by Wharton or Murray. Wharton's balancing machine works in an entirely different way because its objective is entirely different. As noted, Wharton does not apply any pulse to the workpiece, nor does he apply a vibration sensor to a surface of the workpiece. Wharton's vibration sensors (see vibration pickup **66** in Fig. 1, for example) are arranged so that the vibration that is detected is that of the spindle **16** rather than of the workpiece itself. Furthermore, as noted, the character of the vibrations is entirely different from those imparted in the workpiece by the pulse emitter that applies a pulse to the workpiece with a contact time of about 200 ms.

For at least these reasons, it is submitted that Wharton and Murray fail to disclose or suggest the method of Claim 29.

Claim 30 recites that the comparing step comprises comparing the vibration spectrum with reference data so as *to determine whether one or more additional workpieces is/are stuck to the workpiece gripped by the gripping device*. This is neither disclosed nor remotely suggested by Wharton or Murray. If another workpiece were stuck to the workpiece **12** loaded in the chuck **14** of Wharton's balancing machine, it would quickly become unstuck (with possibly dangerous consequences!) as soon as the chuck started rotating the workpiece **12**. As for Murray, if another workpiece were stuck to the bottom of the workpiece gripped by Murray's gripper, the LED-type sensors on the gripper would not be able to detect such a condition, because those sensors can detect only shear forces exerted between the gripper and the top workpiece actually gripped by

the gripper. Because those shear forces arise unintentionally and therefore have no particular correlation to the characteristics of the workpiece(s) held by the gripper, it would be impossible for Murray to deduce characteristics of the workpiece(s) based on the detected shear forces.

Thus, Claim 30 clearly is patentable over Wharton and Murray.

Claims 31 and 32

As noted, the Office Action fails to treat Claims 31 and 32 on the merits. Applicant submits these claims are patentable at least because of their dependence on patentable Claim 22. Additionally, these claims recite that the memory and/or analytical module is structured and arranged to record signals from the vibration sensor, and to compare a vibration spectrum of the workpiece with reference vibration data so as to determine whether one or more additional workpieces is/are stuck to the workpiece gripped by the gripping device (Claim 31), or to compare a vibration spectrum of the workpiece with reference vibration data so as to determine via the vibration spectrum whether the seized workpiece is the correct part (Claim 32).

Neither Wharton nor Murray discloses or suggests a gripping device in accordance with these claims. With respect to Claim 31, the previous remarks in connection with Claim 30 apply here as well. With respect to Claim 32, Wharton's balancing machine does not have any objective or capability of determining whether the workpiece **12** loaded in the chuck **14** is the correct part. Indeed, it would probably be impossible to determine from unbalanced load vibrations sensed in the spindle **16** whether the workpiece **12** is the correct part.

As for Murray, the LED-type sensors on his gripper would not be able to detect whether the gripped workpiece is the correct part or not, because those sensors can detect only shear forces exerted between the gripper and the workpiece. Those shear forces would not have any unique dependence of the particular structure of the workpiece, but rather would depend on the forces exerted on the workpiece (such as when an accidental collision occurs). Therefore, Claims 31 and 32 are patentable over Wharton and Murray.

In summary, the claimed invention provides a novel and ingenious solution to a problem that is not even addressed by Wharton or Murray—i.e., how to detect whether the workpiece gripped by the gripping device of a manipulation system is (1) two or more workpieces stuck together, and/or (2) the correct or incorrect workpiece for the process being fed. This is accomplished by intentionally imparting vibrations in the gripped workpiece, detecting the vibrations with a vibration sensor, and analyzing the vibrations to deduce information about the gripped workpiece. The cited references neither appreciate the problem solved by the claimed invention, nor teach anything actually providing the claimed solution. The inventors thus have made a significant contribution to the art, which would not have been apparent from Wharton and Murray.

Conclusion

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefor (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

Donald M. Hill, Jr.
Registration No. 40,646

Customer No. 00826
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000

ELECTRONICALLY FILED USING THE EFS-WEB ELECTRONIC FILING SYSTEM OF THE UNITED STATES PATENT & TRADEMARK OFFICE ON OCTOBER 19, 2009.